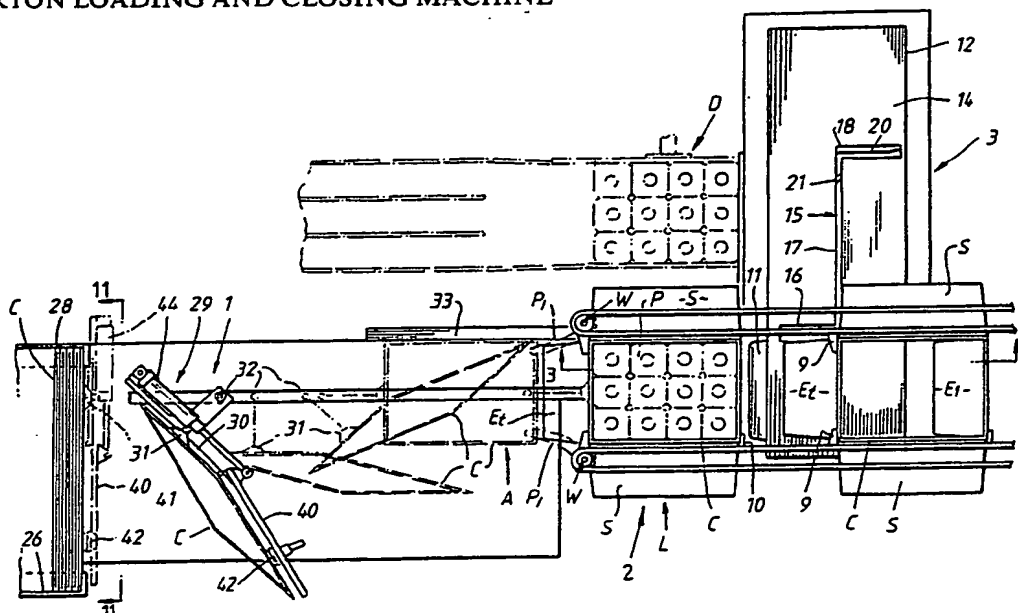


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(54) Title: CARTON LOADING AND CLOSING MACHINE**(57) Abstract**

A carton loading and closing machine comprising a carton opening mechanism (29) adapted to remove a flat carton from a magazine (26) to a park position (A), means for folding the side flaps (S) at the bottom of the carton outwardly, means for loading product (P) into carton through its open bottom, means for indexing the loaded carton forwardly over cam means (11) for folding the leading end flap (Et) under the product, trailing end flap closing means (12) having a slot (15) adapted to receive the trailing end flap and means (20, 21) for causing said trailing end flap (Et) to be folded to the closed position as said folding means (12) is moved transversely with respect to the stationary carton (C), and means for closing the side flaps (S) and the top flaps of the carton.

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1 TITLE: CARTON LOADING AND CLOSING MACHINE

2 Field of the Invention:

3 This invention relates to carton loading and closing
4 machines.

5 Background of the Invention:

6 Machines for the automatic and semi-automatic loading
7 and closing of cartons are widely used in a number of
8 different forms. The most widely used machines may be
9 divided into three categories: a) manual carton-over-
10 product machines, b) top loading machines involving either
11 manual loading or loading by means of drop or place packers
12 and c) bottom loading machines.

13 It is self evident that the avoidance of any manual
14 loading operation is desirable since the labour component is
15 becoming increasingly expensive and the speed of operation
16 of the machine has an inherent operator dependent speed
17 limitation. By the same token, the capital cost of the
18 machine is an important factor. With the exception of drop
19 or place packers, which are expensive, most known automatic
20 machines are limited by the number of cartons which can be
21 loaded and closed in a predetermined time. At present, such
22 lower cost machines are limited to practically achievable
23 speeds of the order of ten to twelve cartons per minute,
24 which are approximately the speeds which can be achieved by
25 a very skilled operator.

26 Automated bottom loading machines are considered to be
27 the most cost effective means of loading since they do not
28 require the cost of a special loading robot of the type
29 needed for a top loading machine, and they have the
30 advantage of providing positive location of the carton at
31 the position in which the products to be packaged are loaded
32 into the carton. Although the reason is not particularly
33 apparent, carton-over-product loading machines require
34 either a skilled operator or a complex mechanism to ensure
35 that the carton properly engages the array of products to be
36 packaged during each loading operation.

37 The attractiveness of bottom loading machines has to
38 date been limited by their restricted speeds of operation

1 and the major restrictions on the speed of operation would
2 appear to be due primarily to the mechanism for initially
3 opening the folded carton and for moving it to the loading
4 position, and the mechanism for closing the bottom of the
5 carton after the product has been loaded.

6 In the case of one known bottom loading machine, the
7 speed of operation of the carton opening mechanism is
8 restricted by the positioning of the carton manipulating arm
9 at the leading part of the carton so that the mechanism must
10 be withdrawn over the carton before any loading operation
11 may take place. In the case of the bottom flap closing
12 operation, the speed of one known mechanism is severely
13 restricted by the requirement that one end flap is first
14 closed by forward movement of the loaded carton through a
15 standard closing plough followed by rotation of the carton
16 to locate the other flap in a closing slot following which
17 the flap is closed by further forward movement through a
18 closing plough. The above factors cause a significant
19 slowing of the loading and closing operation and also serve
20 to complicate the mechanisms which are used in the machine.

21 In addition to the above, most known machines are
22 restricted by the complexity of the operations necessary for
23 converting the machine for the loading of cartons of
24 different sizes. In most cases, the conversion operation is
25 so complex that it is more practical to restrict each
26 machine to the loading and closing of a particular size of
27 carton. This is clearly not economic both in terms of
28 capital cost and efficiency of use of equipment and factory
29 space.

30 Summary of Invention and Objects:

31 It is the object of the present invention to provide an
32 improved carton loading and closing machine in which the
33 above deficiencies of the prior art are at least
34 ameliorated.

35 Accordingly, the invention provides a carton loading
36 and closing machine comprising means for locating an open
37 carton in a first predetermined position, means for loading
38 said carton through the open bottom flaps of said carton at

1 said first predetermined position, means for moving said
2 carton forwardly to a second predetermined position over
3 means for folding the leading end flap of said carton to the
4 closed position under said packaged products, second flap
5 folding means mounted for movement transversely of said
6 carton at said second predetermined position to fold said
7 trailing end flap against said packaged products, said
8 second flap folding means including an upper surface
9 defining an opening for receiving said trailing flap and
10 means for causing said trailing flap to be folded to the
11 closed position as said second flap folding means is moved
12 transversely with respect to said carton.

13 In another aspect, the invention provides a method of
14 loading and closing a carton comprising the steps of
15 locating an open carton in a first predetermined position
16 with the lowermost flaps of said carton open, loading the
17 products to be packaged into said carton through said open
18 bottom flaps at said first predetermined position, moving
19 said carton forwardly to a second predetermined position and
20 folding the leading end flap of said carton to its closed
21 position under the packaged products during said forward
22 movement, and closing the trailing end flap of said carton
23 to its closed position under said packaged products while
24 said carton is held stationary at said second predetermined
25 position.

26 It will be appreciated from the above that the carton
27 loading and closing machine and method defined produce a
28 partly closed carton with only one forward movement of the
29 carton, with no rotary movement of the carton being
30 required. Since both the first and second predetermined
31 positions of the carton may be accurately defined, the
32 carton may be indexed to such positions quite rapidly and
33 since the trailing end flap is closed by movement of a
34 closing means rather than by movement of the carton, this
35 operation may also be achieved more rapidly than in the case
36 of prior art machines, using otherwise "dead time" of the
37 machine. While no mention is made in the above definitions
38 of the closing of the side flaps or the top flaps of the

1 carton, this operation may be achieved in a straightforward
2 manner by existing carton closing techniques which need not
3 be further defined in the present specification.

4 A further advantage of the defined machine and method
5 is that the indexing positions of the first and second
6 predetermined positions are defined by the rear face of the
7 carton and accordingly the size of the carton being loaded
8 and closed does not affect either the nature of the carton
9 opening mechanism which presents the carton to the first
10 predetermined position, and which is described in greater
11 detail below, or the means for closing the trailing end flap
12 which is located at the trailing edge of the carton in the
13 second predetermined position. These factors result in
14 significant simplification of the changes which are required
15 to accommodate cartons of different size.

16 The machine defined above is associated with a carton
17 opening mechanism which presents the carton in the open
18 state at the first predetermined position. While a
19 preferred carton opening mechanism will be described below,
20 it should be appreciated that the machine as defined above
21 may be used with varying degrees of efficiency with any
22 carton opening mechanism. However, for maximum efficiency,
23 the carton opening mechanism to be defined below is
24 preferred.

25 The preferred carton opening mechanism preferably
26 comprises means for holding a multiplicity of folded
27 cartons, means for lifting a carton from said multiplicity
28 by one end panel of said carton, means for moving the carton
29 from its initial position to an intermediate position
30 adjacent said first predetermined position and for rotating
31 the carton through 180° during said movement so that the
32 said lifting means is located at the rearmost end panel of
33 the carton, and fixed rail means located to one side of said
34 intermediate position and against which a leading corner of
35 said carton engages whereby part of said rotary movement of
36 said carton causes the carton to be fully opened when
37 located at said intermediate position, and means for
38 indexing said carton from said intermediate position to said

1 first predetermined position with the side flaps of said
2 carton extending laterally to either side of the carton and
3 said end flaps extending downwardly from said carton.

4 The principle advantages of the above arrangement are:

5 (a) As a result of the partial rotation of the carton
6 from the pickup point to the intermediate position results
7 in the means for lifting the carton from the multiplicity of
8 cartons being located at the rearmost panel of the carton
9 when erected, thereby enabling the lifting means to retract
10 directly to the pickup position without in any way
11 inhibiting the progress of the carton to the next position.

12 (b) The use of a fixed rail against which the carton
13 engages to cause its opening or erection enables the
14 mechanism to be used for different sized cartons without
15 significant adjustments to the mechanism.

16 The mechanism preferably includes a fixed finger which
17 temporarily engages the trailing walls of the carton during
18 the initial pickup operation to "break" the carton to a
19 slightly open position whereby the carton is less resistant
20 to the subsequent opening operation on engagement with the
21 fixed rail.

22 It will be appreciated that when the above mechanism is
23 used in combination with the carton loading and closing
24 machine defined above, the efficiencies of operation of the
25 loading and closing machine are able to be maximized due to
26 the ability of the mechanism to operate at relatively high
27 speeds. In a preferred form of the above defined mechanism,
28 the means for lifting cartons from the multiplicity of
29 cartons comprises an arm carrying a vertically oriented pair
30 of suction cups of known form which adhere to the surface of
31 the carton end wall to lift a carton from a magazine
32 carrying said multiplicity of cartons. In a particularly
33 preferred arrangement, the suction cups are positioned so as
34 to engage one end wall of the carton at a position adjacent
35 the crease line between that end wall and the exposed side
36 wall of the carton. This "off-centre" pickup point assists
37 in initially opening the carton as the mechanism rotates
38 from its initial pickup position to the intermediate

1 position where the leading corner of the carton first
2 engages the fixed rail.

3 The mechanism by which the above carton pickup and
4 erection is achieved is not important to the invention and
5 may comprise a combination of cams and tracks and chain
6 drives or any other acceptable mechanical mechanism for
7 causing the necessary motions.

8 Brief Description of the Drawings:

9 One preferred form of the present invention will now be
10 described with reference to the accompanying drawings in
11 which:

12 Figure 1 is a perspective view of a carton erecting,
13 loading and closing machine embodying the invention;

14 Figure 2 is a plan view of the machine shown in Fig. 1;

15 Figure 3 is a sectional elevation of the loading and
16 flap closing section of the machine taken along the line 3-3
17 in Fig. 2;

18 Figures 4a, b, c to 7a, b, c are sectional plan views
19 taken along the line 4-4 in Fig. 3 and along the lines b-b
20 and c-c respectively of Figs. 4 to 7;

21 Figure 8 is a plan view of a modified bottom end flap
22 closing mechanism;

23 Figure 9 is a sectional elevation of the mechanism of
24 Fig. 8 taken along the line 9-9;

25 Figure 10 is a plan view of a further modified bottom
26 end flap closing mechanism, and

27 Figure 11 is a front elevation of the carton pickup and
28 erecting mechanism shown in Figs. 1 and 2, and taken along
29 the line 11-11 in Fig. 2.

30 Description of Preferred Embodiment:

31 Referring firstly to Figures 1 to 3 of the drawings,
32 the carton erecting, loading and closing machine will be
33 seen to comprise a carton erecting mechanism 1, a carton
34 loading mechanism 2 for loading products into a carton C, a
35 trailing end flap closing mechanism 3 and a bottom side flap
36 and top flap closing mechanism 4 of known construction which
37 does not form part of the present invention.

38 Since the carton erecting mechanism 1 is not essential

1 to the present invention, the loading and trailing end flap
2 folding mechanisms 2 and 3 will now be further described.
3 As will be noted from Figures 1 to 3, the carton C which
4 has been erected by the mechanism 1 is indexed to a first
5 predetermined position, or loading position, L with the side
6 flaps S of the carton C extending perpendicularly from the
7 sides of the carton C and the end flaps E extending
8 downwardly as shown in Figure 3. The side flaps S are moved
9 to the position shown in Figure 2 by a known "plough"
10 arrangement P₁ commonly used in the industry which causes
11 movement of the flaps as the carton C is transferred from
12 the intermediate position A (Fig. 2) which may be a "park"
13 position if desired by the erecting mechanism 1 to the
14 loading position L. Similarly, the mechanism for achieving
15 indexing movement of the carton is not shown in detail and
16 may again take any suitable form known in the industry, such
17 as the chain and dog mechanism W shown schematically in
18 Figures 2 and 3 of the drawings, or any other suitable form
19 of mechanism, such as a flight bar system.

20 The loading mechanism 2 comprises a product elevator 5
21 comprising a platform 6 supported by brackets 7 carried by
22 vertical guide rails 8 for vertical reciprocal movement by
23 any suitable mechanical means B. The elevator 5 is shown in
24 its elevated position in solid outline and in its lowered
25 position in broken outline. The product P is loaded onto
26 the platform in predetermined arrays adapted to fill the
27 carton C by a known collating mechanism D.

28 It will be appreciated from the above description that
29 a carton C is delivered by the erecting mechanism 1 to the
30 loading position L and is positively held in that position
31 by indexing lugs 9 and 10 on an indexing conveyor (not
32 shown), as shown schematically in Figures 2 and 2 of the
33 drawings. The product array P is then elevated vertically
34 by the elevator 5 and enters the carton C through the open
35 bottom flaps S and E. While the platform 6 remains in its
36 elevated position, the carton and enclosed product array P
37 is indexed forwardly onto the end flap closing mechanism 3,
38 during which operation the leading end flap E₁ engages a

1 flap closing cam or bridging plate 11 adjacent the side of
2 the mechanism 3 whereby the flap E_1 is positioned under the
3 product array P. During the same movement, the trailing end
4 flap E_t is cammed by the plate 11 and the surface of the
5 platform 6 to a perpendicular trailing position as shown in
6 Figures 2 and 3 of the drawings. The side flaps S remain in
7 the same position.

8 The trailing end flap closing mechanism 3 will be seen
9 to comprise a shuttle platform 12, which is shown in greater
10 detail in Figures 4 to 7 of the drawings, having a generally
11 planar upper surface 14 in which a shaped slot 15 is formed.
12 The slot 15 has an entry portion 16, a transfer portion 17
13 and an exit portion 18 through which the trailing flap E_t is
14 adapted to pass. The entry portion 16 has an upwardly
15 directed lip 19 which is adapted to capture the trailing end
16 flap E_t while the exit portion 18 has a downwardly directed
17 lip 20 which ensures that the then folded flap E_t exits
18 smoothly onto the top surface 14 of the shuttle 12. A
19 shaped camming rod or "plough" 21 extends across the shuttle
20 12 under the surface 14 intersecting the slot portion 17 and
21 18 in the manner shown most clearly in Figure 4 of the
22 drawings. The camming rod 21 operates to turn the trailing
23 end flap E_t , from the position, as shown in Figure 5,
24 through just over 180° to its closed position under the
25 product array P.

26 The shuttle 12 is supported for its transverse movement
27 on linear bearings 22, 23 and is reciprocated by any
28 suitable mechanism, such as a chain drive mechanism or a
29 pneumatic cylinder (not shown).

30 The manner in which the shuttle 12 operates to inwardly
31 fold the trailing end flap E_t will be more clearly
32 understood from a consideration of Figures 4 to 7 of the
33 drawings, which show the several stages in the flap folding
34 movement of the shuttle 12. In Figure 4, the carton C
35 containing product P (not shown in Fig. 4(a) or (c)) has
36 been indexed forwardly to a position where the leading end
37 flap E_1 has been folded under the product by the cam 11 (not
38 shown in Figs. 4 to 7), and the product is partly supported

1 by the support track of the machine and partly by the upper
2 surface 14 to the shuttle 12. In this position, the trailing
3 end flap E_t is aligned with the entry portion 16 of the slot
4 15, with the upwardly directed lip 19 positioned to engage
5 the upper surface of the end flap E_t as the shuttle is moved
6 transversely past the position of the carton C. As the flap
7 E_t enters the transfer portion 17, the flap E_t assumes the
8 position shown in Fig. 5(b) and one of its side edges is
9 engaged by the rod 21 and the flap E_t is turned by the rod
10 21, as the shuttle 12 continues its transverse movement, to
11 the position shown in Fig. 6 of the drawings. Further
12 transverse movement of the shuttle 12 causes the flap E_t to
13 be engaged by the downwardly directed lip 20 which completes
14 the flap turning operation as the flap E_t leaves the slot 15
15 through the exit portion 18, at which point it is fully
16 folded under the product P, as shown in Fig. 7 of the
17 drawings. It will be appreciated that the trailing end flap
18 closing operation described above takes place during an
19 otherwise "dead time" of the machine and is achieved without
20 any forward or reverse movement of the carton C. In this
21 way, the overall length of the machine may be significantly
22 reduced compared with prior art loading and flap closing
23 machines.

24 Following the trailing flap folding operation, the
25 carton C is indexed forwardly under the flap folding
26 mechanism 4 which folds the top and bottom side flaps S in a
27 known manner which does not require further description. It
28 will be seen from Figure 3 of the drawings that the top end
29 flaps of the carton C may be folded to the closed position
30 as the carton C is located in the loading position L
31 although they may also be closed at the next indexing
32 station.

33 Referring now to Figures 1, 2 and 11 of the drawings,
34 the preferred carton erecting mechanism 1 will now be
35 briefly described. The mechanism will be seen to comprise a
36 supporting frame 25 having a magazine 26 for supporting a
37 stack of carton C on their edges with the side panels and
38 end and side flaps disposed in a substantially vertical

1 plane adjacent the end of the support frame 25. The
2 magazine 26 has an adjustable fitting 27 having a downwardly
3 projecting pin 28 which engages the upper edges of the
4 cartons and serves to "break" each carton slightly open as
5 it is withdrawn from the stack. A carton
6 transporting/opening device 29 includes a support plate 30
7 carrying a pair of vertically arranged suction cups 31, and
8 an outwardly extending arm 40 fixed to one vertical edge of
9 the plate 30 by hinge means 41 and carrying a suction cup 42
10 in a slot 43 in the arm 40 in a manner which allows pivotal
11 movement of the arm 40 with respect to the plate 30 while
12 the suction cup 42 adheres to one side wall of the carton C.
13 The arm 40 is spring biased, by means not shown, to adopt
14 the rest position shown in Figure 2 of the drawings
15 immediately a carton C is released from the magazine 26. A
16 pneumatic ram 44 is connected between the plate 30 and the
17 arm 40 and is operated as the carton moves from the magazine
18 26 to the intermediate position A to positively move the
19 side wall to which the suction cup 42 is attached towards
20 the open position. This serves to resist any likelihood of
21 the crease line C_1 buckling inwardly to inhibit proper
22 opening of the carton C.

23 To facilitate rotational and translatory movement of
24 the carton C, the plate 30 is mounted on a vertical post 32
25 which is movable longitudinally of the frame 25 from the
26 pickup position adjacent the magazine 26 to the intermediate
27 or "park" position A ready for indexing into the loading
28 position L. The mechanism by which the rotary and
29 longitudinal movement of the lifting mechanism 29 is
30 achieved is not important to the invention and is therefore
31 not shown in the drawings. It may comprise a combination of
32 cam tracks and chain drives designed to achieve the
33 necessary motions.

34 The transporting/opening mechanism 1 further comprises
35 a fixed rail 33 (Fig. 2) positioned to one side of the
36 desired intermediate or "park" position A for the carton C.
37 The fixed rail 33 is adapted to be engaged by the carton C
38 as it is moved towards the intermediate position to

1 facilitate the final erection of the carton as shown in Fig.
2 2. It will be appreciated from the above that the suction
3 cups 31 and 42 will be attached to a source of suction (not
4 shown) to facilitate the positive gripping of each carton C
5 by the mechanism 29.

6 The transporting/opening mechanism 29 is positioned so
7 that each carton C is engaged by the suction cups 30 on its
8 exposed end wall and by the suction cup 42 on the exposed
9 side wall. As the carton is initially withdrawn from the
10 magazine 26, the pin 28 momentarily anchors the trailing
11 panels of the carton C thereby "breaking" open slightly the
12 carton C as it is withdrawn from the magazine 26. The
13 mechanism 29 then moves from the pickup position adjacent
14 the magazine 26 to the "park" position A shown in Figure 2
15 at the same time rotating through approximately 180°. This
16 movement, as well as actuation of the ram 44, serves to
17 further open the carton and as the leading corner of the
18 carton engages the fixed rail 33 and the lifting mechanism
19 29 continues to rotate and move towards the "park" position
20 A, the carton C will be fully opened with the side flaps S
21 and the end flaps E directed upwardly and downwardly as
22 shown in Figure 2.

23 It will be appreciated that since the carton C is
24 rotated as described above, the lifting mechanism 29 is
25 disposed in the "park" position A to the rear of the carton
26 C so that the mechanism 29 may be withdrawn to its pickup
27 position without in any way inhibiting the continued forward
28 movement of the carton C. Thus, the mechanism may return to
29 pick up a further carton C as the preceding carton C is
30 loaded in the manner described above thereby improving the
31 efficiency of operation of the combination of the
32 transporting/erecting mechanism 29 and the loading and
33 closing mechanism.

34 As mentioned above, the transporting/opening mechanism
35 29 may be replaced by another mechanism although a mechanism
36 in which the transporting mechanism is finally disposed at
37 the rearmost panel of the carton is to be preferred for the
38 reasons outlined above. Similarly, the trailing end flap

1 closing mechanism 3 may be replaced by any other suitable
2 mechanism which performs a similar function. For example,
3 one shortcoming of the shuttle mechanism 12 described above
4 is that it is somewhat longer than may be desired where the
5 space in which the machine must operate is somewhat limited.
6 In such a situation, the shuttle mechanism 12 may be
7 significantly shortened and its operation modified so that
8 movement in one direction causes the trailing flap E_t to
9 enter the entry portion of the slot 15 whereupon a cam or
10 arm pushes the flap slightly towards its closing direction
11 whereupon the shuttle is moved in the opposite direction
12 whereby a cam rod or plough similar to item 21 engages the
13 flap to push it fully to its closed position. While some
14 reversal of direction is required in this modification, the
15 time taken to close the flap E_t should not be significantly
16 greater than the time taken to perform the same operation in
17 the previous embodiment.

18 A modified form of shuttle mechanism 12' is shown in
19 Figures 8 and 9 of the drawings. In this arrangement, the
20 upper surface 14' of the shuttle is formed with a somewhat
21 similarly shaped slot 15' having an entry portion 16', a
22 transfer portion 17' and an exit portion 18' through which
23 the trailing flap E_t is adapted to pass. In this embodiment
24 however, the entry portion 16' does not have an upwardly
25 directed lip as in the previous embodiment, but rather has a
26 shaped flap 19a hinged to the upper surface 14' at 19b and
27 having a downwardly depending cam 19c (Fig. 9) which is
28 adapted to be engaged by a cam following 19d fixed to the
29 rod 19e of an air cylinder 19f, by means of which the flap
30 19a may be elevated to the position shown in Fig. 9 from the
31 flat or planar position shown in Fig. 8 in which an
32 essentially planar surface is presented. The shuttle is also
33 provided with a camming rod 21' and the exit portion 18' has
34 a downwardly directed to surface 20' by means of which the
35 trailing flap E_t of the carton C is folded in the manner
36 described in the previous embodiment.

37 The advantage provided by the above alternative shuttle
38 12' is that the flap 19a may be elevated by means of a timed

1 valve operation to open the entry portion 16' to receive the
2 flap E_t as the shuttle moves transversely under the carton
3 C. When the shuttle reaches the position similar to that
4 shown in Fig. 7 of the drawings, the flap 19a may be lowered
5 and the shuttle 12' return to its rest position as the next
6 carton C is moved into a position similar to that shown in
7 Fig. 4 of the drawings. In this way, time is saved and the
8 operation may be accelerated accordingly. It will be
9 appreciated that the upwardly directed lip 19 of the
10 previous embodiment prevents this time saving being
11 achieved.

12 In the alternative form shown in Figure 10 of the
13 drawings, the width of the shuttle 12'' is effectively
14 halved and a removable support 19'' is secured to one edge
15 to provide support for the carton C in the position
16 corresponding substantially to that shown in Figure 4 of the
17 drawings. The length of the portion 19'' corresponds to the
18 width of the carton C, and the portion 19'' is removable so
19 that cartons of different sizes may be accommodated without
20 replacing the shuttle completely. The portion 19'' defines
21 an edge 16'' past which the trailing end flap E_t is allowed
22 to move as the shuttle 12'' moves transversely under the
23 carton C. The longitudinal edge 15'' corresponds to the slot
24 15 and guides the flap E_t towards a shaped camming plate 21'
25 which curves inwardly and upwardly towards the trailing edge
26 of a slot 18'' in the upper surface 14'' of the shuttle
27 12''. The plate 21'' performs the same function as the
28 camming rod 21 in the previous embodiment. In the present
29 embodiment, the plate 21'' may be cast from aluminium or
30 moulded from some suitably rigid plastics material. It will
31 be appreciated that as the shuttle 12'' moves under the
32 carton C, the trailing flap E_t drops past the edge 16'' and
33 assumes the position adjacent the longitudinal edge 15''
34 until it is engaged by the camming plate 21 which turns the
35 flap E_t towards the closing position whereupon it exits from
36 the slot 18'' and rests on the upper surface 14'' of the
37 shuttle 12''. It will also be appreciated that a camming
38 plate similar to 21'' may be used in the previous described

1 embodiments. In this modified arrangement, the removable
2 support 19, not only supports the carton, but also performs
3 the camming function performed by bridging plate 11 in the
4 first embodiment. Thus, the width of the cam and shuttle
5 portion of the machine is reduced, thereby allowing an
6 overall reduction in the length of the machine.

7 As mentioned briefly at the beginning of this
8 specification, the arrangements described above also have
9 the advantage of requiring less adjustment to accommodate
10 cartons of different sizes than machines according to the
11 prior art. This results primarily from the use of the fixed
12 rail 33 and the indexing of the cartons to positions
13 dictated by the rearmost face of the carton in each
14 operative position. By indexing at the rear face, the
15 length of the carton is not important and only minimal
16 adjustment is required to compensate for different widths.
17 In this regard the shuttle 12 is designed to accommodate end
18 flap widths of all dimensions, the entry portion 20 of the
19 slot 15 being wide enough for this purpose. This also
20 results in the mechanism for collating the products for
21 delivery to the platform 6 being easier to adjust for
22 changes in carton dimension.

1 CLAIMS:

2 1. A carton loading and closing machine comprising means
3 (1) for locating an open carton (C) in a first predetermined
4 position (L), means (2) for loading said carton through the
5 open bottom flaps of said carton (C) at said first
6 predetermined position (L), means (W) for moving said carton
7 forwardly to a second predetermined position over means (11)
8 for folding the leading end flap (E_l) of said carton to the
9 closed position under said packaged products (P), second
10 flap folding means (3,12) mounted for movement transversely
11 of said carton at said second predetermined position to fold
12 said trailing end flap (E_t) against said packaged products
13 (P), said second flap folding (3,12) means including an
14 upper surface (14) defining an opening (15) for receiving
15 said trailing flap (E_t) and means (20,21) for causing said
16 trailing flap to be folded to the closed position as said
17 second flap folding means (12) is moved transversely with
18 respect to said carton (C).

19 2. The machine of claim 1, wherein said second flap
20 folding means (3) comprises a reciprocating shuttle means
21 (12) including said upper surface (14) defining said opening
22 (15) for receiving said trailing flap (E_t), said opening
23 (15) including a first portion (16) extending generally
24 transversely of the direction of movement of said shuttle
25 means (12), a second portion (17) extending longitudinally
26 of the direction of movement of the shuttle means (12), and
27 a third portion (18) extending transversely of the direction
28 of movement of the shuttle means (12) in a direction
29 opposite to said first portion (16), said first portion (16)
30 being positioned to enable said trailing end flap to
31 penetrate said upper surface (14), said second portion (17)
32 being positioned to enable relative movement between said
33 shuttle means (12) and said carton (C), and said third
34 portion being positioned to enable said trailing flap (E_t)
35 to engage said upper surface (14) in its folded condition,
36 said means for causing said trailing flap to be folded
37 including means (21) for engaging said trailing flap while
38 associated with said second portion (17) and for partly

1 turning said flap towards the closed position and means (20)
2 associated with said third portion (18) for completing the
3 folding of said flap as said shuttle means moves relative to
4 said flap to allow said flap to pass through said third
5 portion (18).

6 3. The machine of claim 2, wherein said opening (15) is in
7 the form of a narrow slot having said first, second and
8 third portions (16,17,18), said upper surface (14) being
9 formed with an upwardly extending lip (19) along the
10 trailing edge of said first portion (16) of said slot (15),
11 and a downwardly extending lip (20) associated with the
12 trailing edge of said third portion (18) of said slot (15).

13 4. The machine of claim 2 or 3, wherein said means for
14 causing said trailing flap to be folded includes a camming
15 rod (21) extending generally diagonally to the direction of
16 travel of said shuttle means (12) and intersecting said
17 second portion (17) and said third portion (18) of said
18 opening or slot (15).

19 5. The machine of claim 3, wherein said first portion of
20 said slot is defined by a pivoted plate (19a) capable of
21 being elevated from a position in which it is generally co-
22 planar with said upper surface (14) to an elevated position
23 in which the trailing edge of said first portion (19') of
24 said slot (15') is upwardly inclined to receive the trailing
25 end flap (E_t).

26 6. The machine of claim 2, wherein said opening is a
27 generally rectangular opening formed in one edge of said
28 shuttle means (12'') to define said first and second
29 portions (16'',17''), said third portion (18'') comprising a
30 slot (18'') formed in said upper surface (14'') and opening
31 to said second portion (17''), and a camming surface (21'')
32 extending from said slot (18'') and laterally of said second
33 portion (17'') to cause folding of said trailing end flap
34 (E_t) to the closed position.

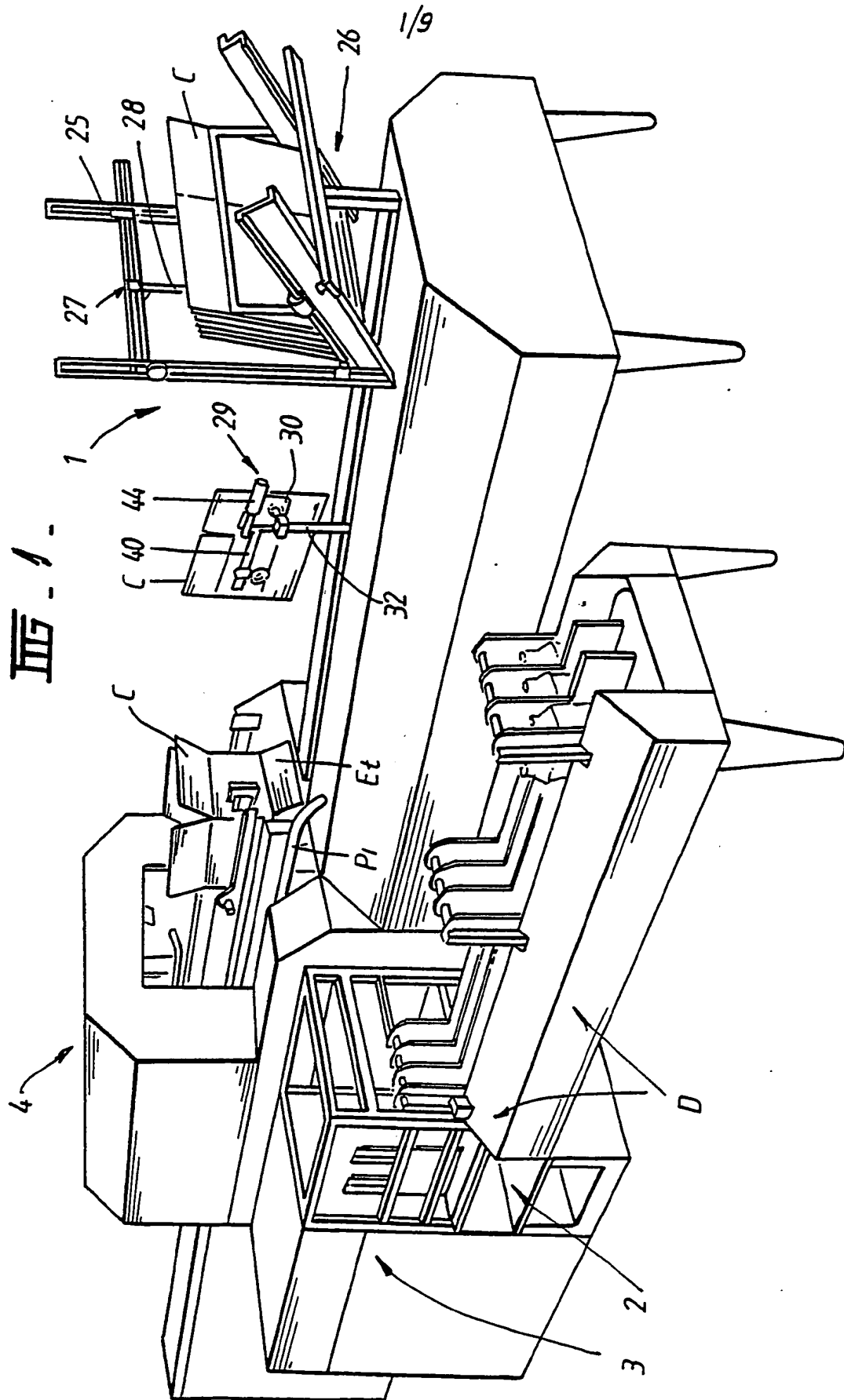
35 7. A carton loading and closing machine, comprising means
36 (30,31) for removing a collapsed carton from a stack and
37 arranged to contact at least one end wall of the carton,
38 means (29) for unfolding the carton into a generally

1 rectangular state and for locating said unfolded carton in a
2 first predetermined position (A), said unfolding and
3 locating means including a rail (33) against which said
4 unfolding means causes said carton to be engaged with one
5 side wall of said carton being located against or adjacent
6 to said rail, said means (30,31) for removing said carton
7 being adapted to turn through about 180° so that when the
8 unfolded carton is located in said predetermined position
9 (A), said removing means is located adjacent the rear most
10 end wall of the carton, means for moving said carton to a
11 second predetermined position (L) with the bottom side flaps
12 of the carton extending outwardly from the sides, means (2)
13 for loading said carton through the open bottom flaps of
14 said carton at said second predetermined position (L), means
15 (W) for moving said loaded carton to a third predetermined
16 position and for folding one of the end flaps (E₁) at the
17 bottom of the carton to its closed position, means (3,12)
18 for folding the other end flap at the bottom of the carton
19 to its closed position while the carton is held stationary
20 at said third predetermined position, said first, second and
21 third predetermined positions being defined by the rear end
22 wall of the carton whereby the size of carton being loaded
23 and closed by said machine may be altered to accommodate a
24 wide range of different carton sizes without structural
25 alteration of the machine.

26 8. The machine of claim 7, wherein said second flap
27 folding means is as defined in any one of claims 1 to 6.

28 9. A carton transporting and opening mechanism (1),
29 comprising means (26) for holding a multiplicity of folded
30 cartons (C), means (29) for lifting one of said cartons (C)
31 from said multiplicity by at least one end panel of said
32 carton, means for moving the carton from its initial
33 position through an intermediate position (A) to a first
34 predetermined position (L) and for rotating said carton
35 through about 180° during said movement whereby the lifting
36 means is located at the rear most end panel of said carton
37 (C), and fixed rail means (33) located to one side of said
38 intermediate position (A) and against which a leading corner

1 of said carton engages whereby part of said rotary movement
2 of said carton causes the carton to be fully opened when
3 located at said first predetermined position (L).
4 10. The mechanism of claim 9, wherein said lifting means
5 further includes a hinged arm (40) extending laterally from
6 said lifting means (29) and carrying means (42) for engaging
7 the adjacent side wall of said carton, said arm (40) having
8 means (44) for rotating said arm in a direction tending to
9 open the carton as said lifting means lifts a carton from
10 said multiplicity.
11 11. The mechanism of claim 10, wherein said movement of
12 said arm is achieved by spring biasing means, said arm
13 further including means (44) for positively pivoting said
14 arm (40) in the carton opening direction as said carton is
15 transported towards said first predetermined position (A).
16 12. The machine of any one of claim 1 to 8 further
17 including the carton opening mechanism defined in any one
18 claims 9 to 11.
19 13. A method of loading and closing a carton comprising the
20 steps of locating an open carton in a first predetermined
21 position (L) with the lowermost flaps of said carton open,
22 loading the products to be packaged into said carton through
23 said open bottom flaps at said first predetermined position
24 (L), moving said carton (C) forwardly to a second
25 predetermined position and folding the leading end flap of
26 said carton to its closed position under the packaged
27 products during said forward movement, and closing the
28 trailing end flap of said carton to its closed position
29 under said packaged products while said carton is held
30 stationary at said second predetermined position.



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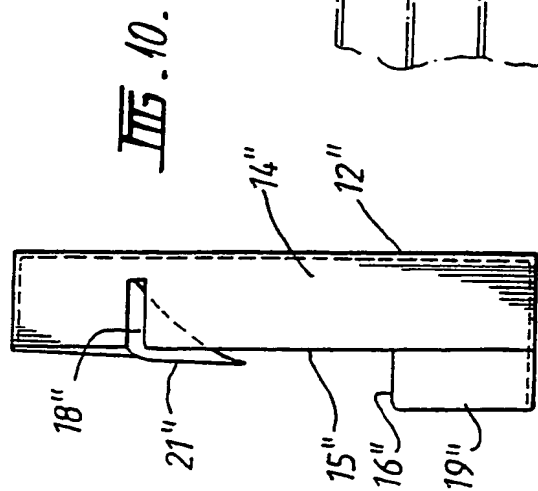
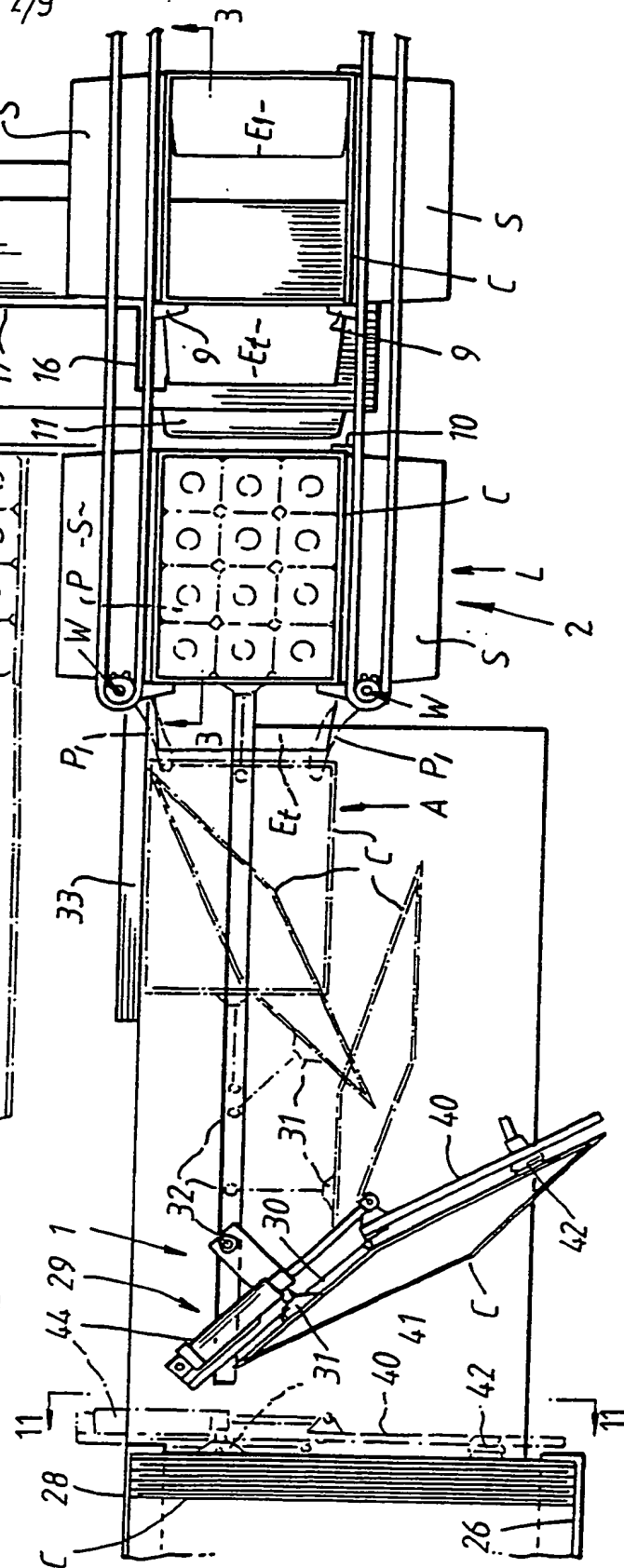
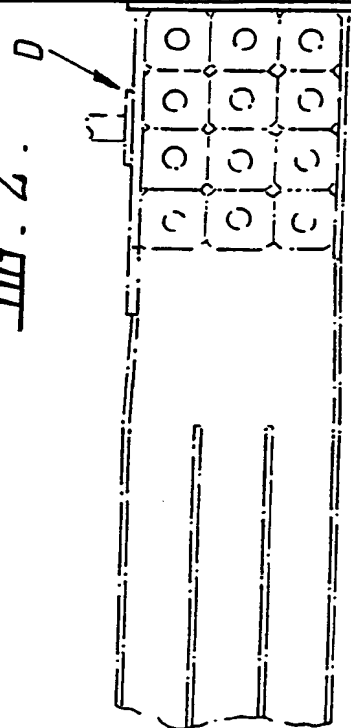
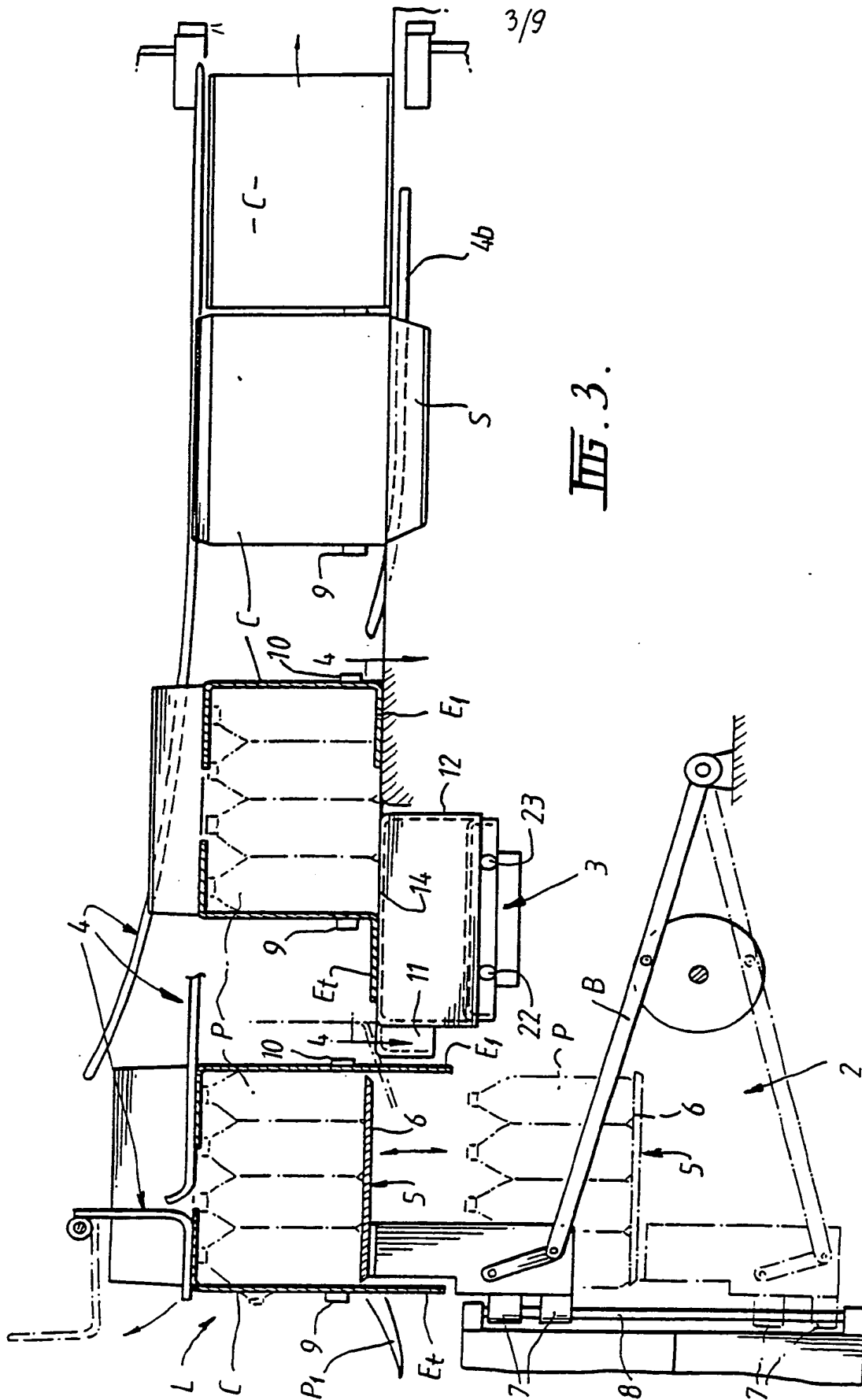


FIG. 2.





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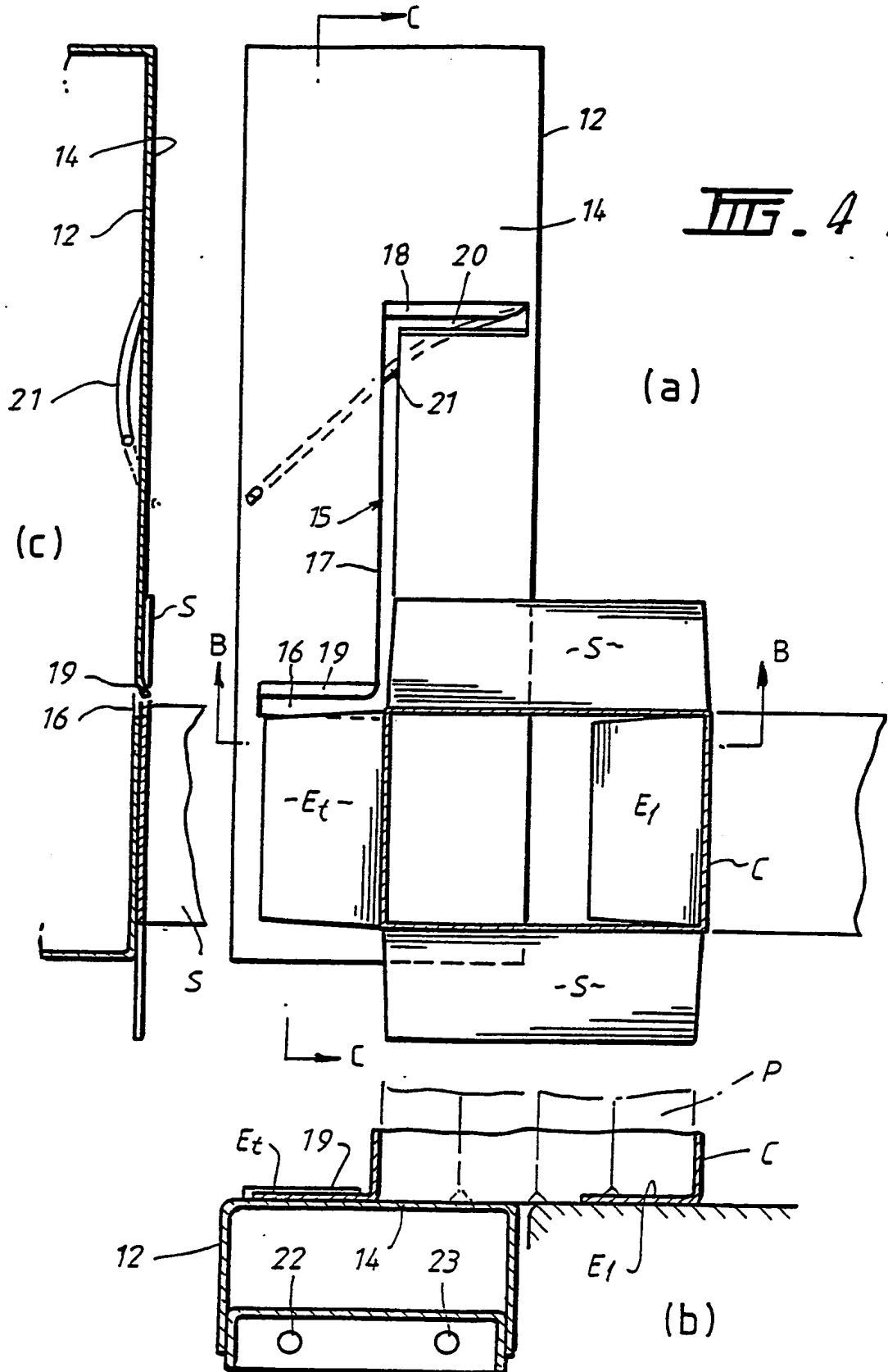


FIG. 4

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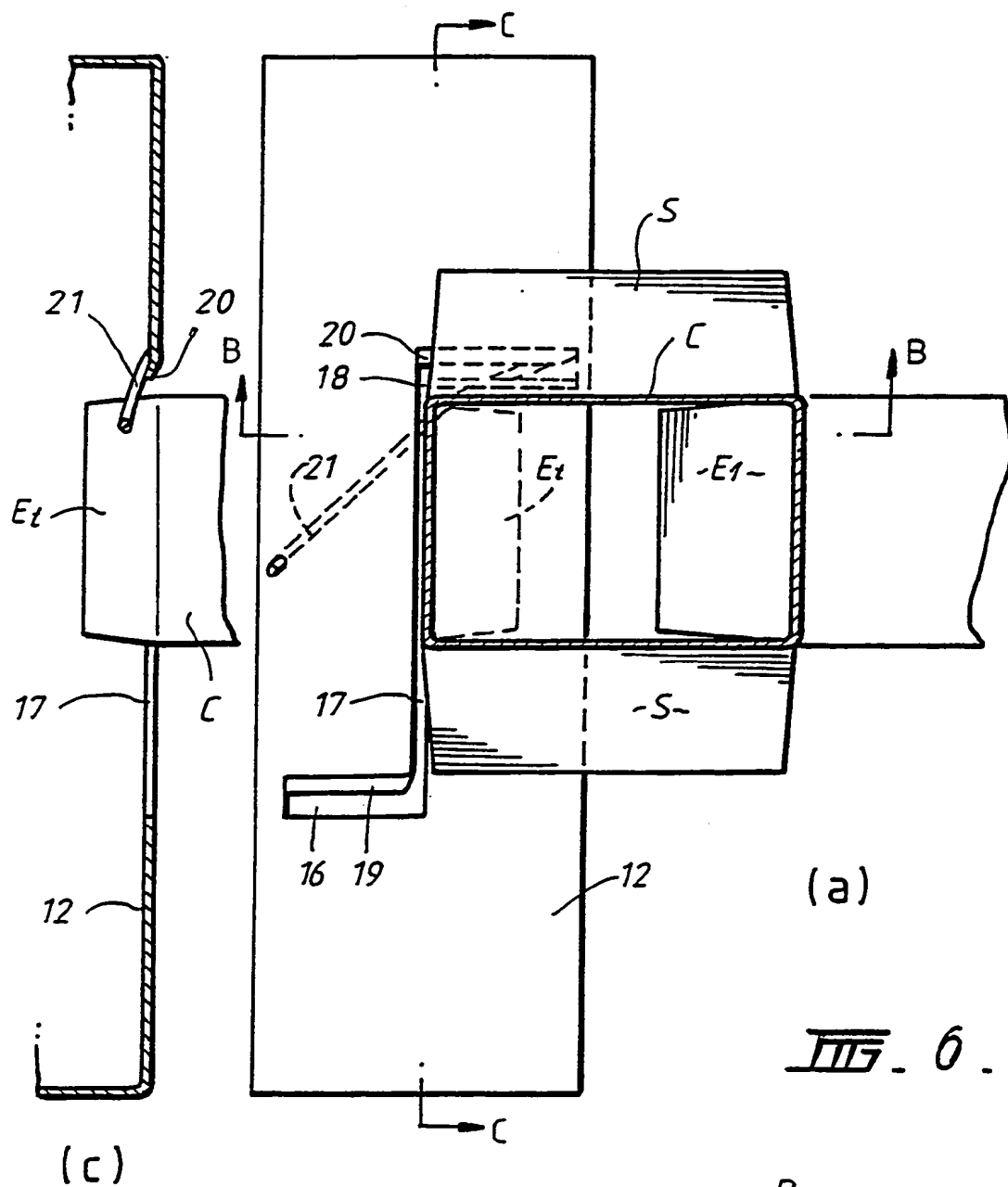
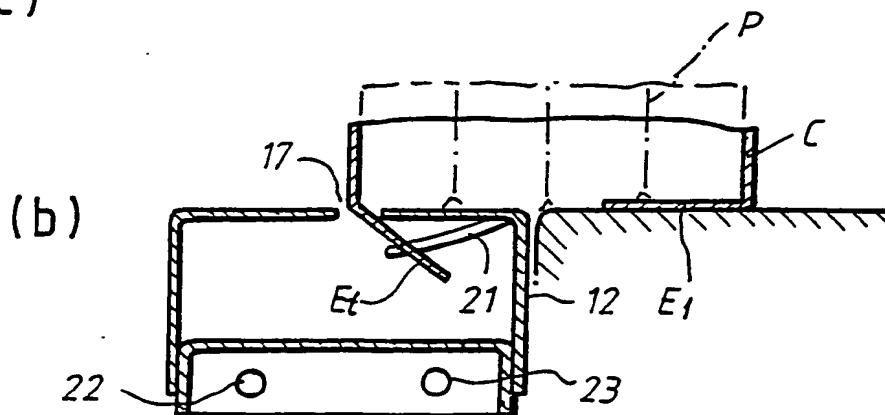


FIG. 6.



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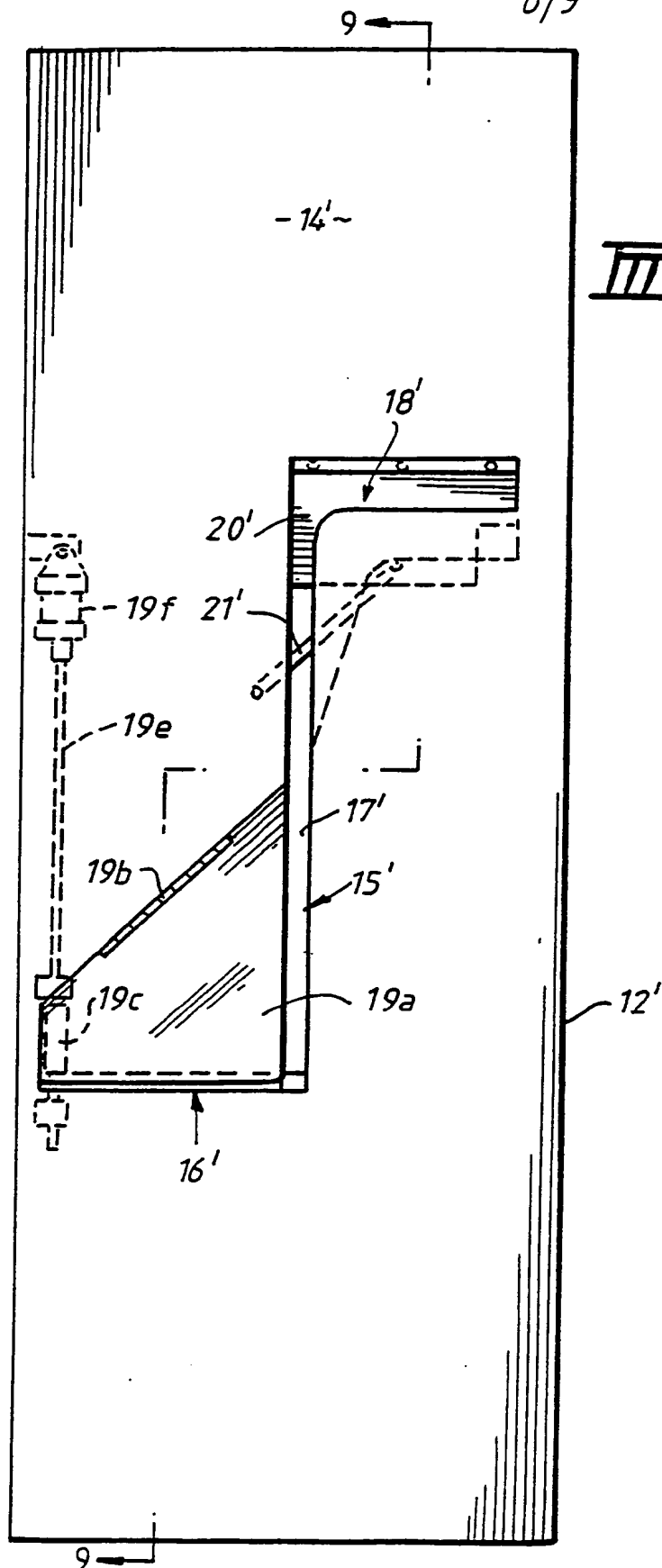


FIG. 8.

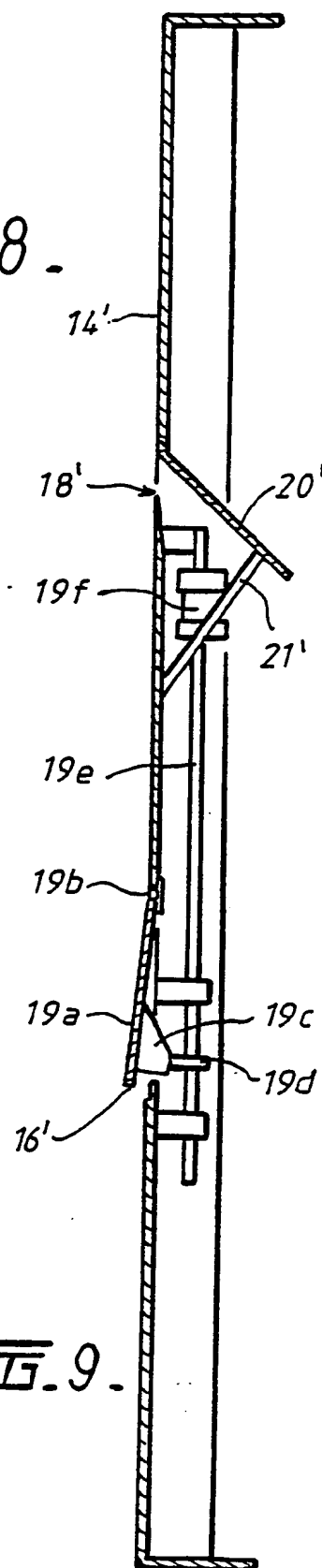
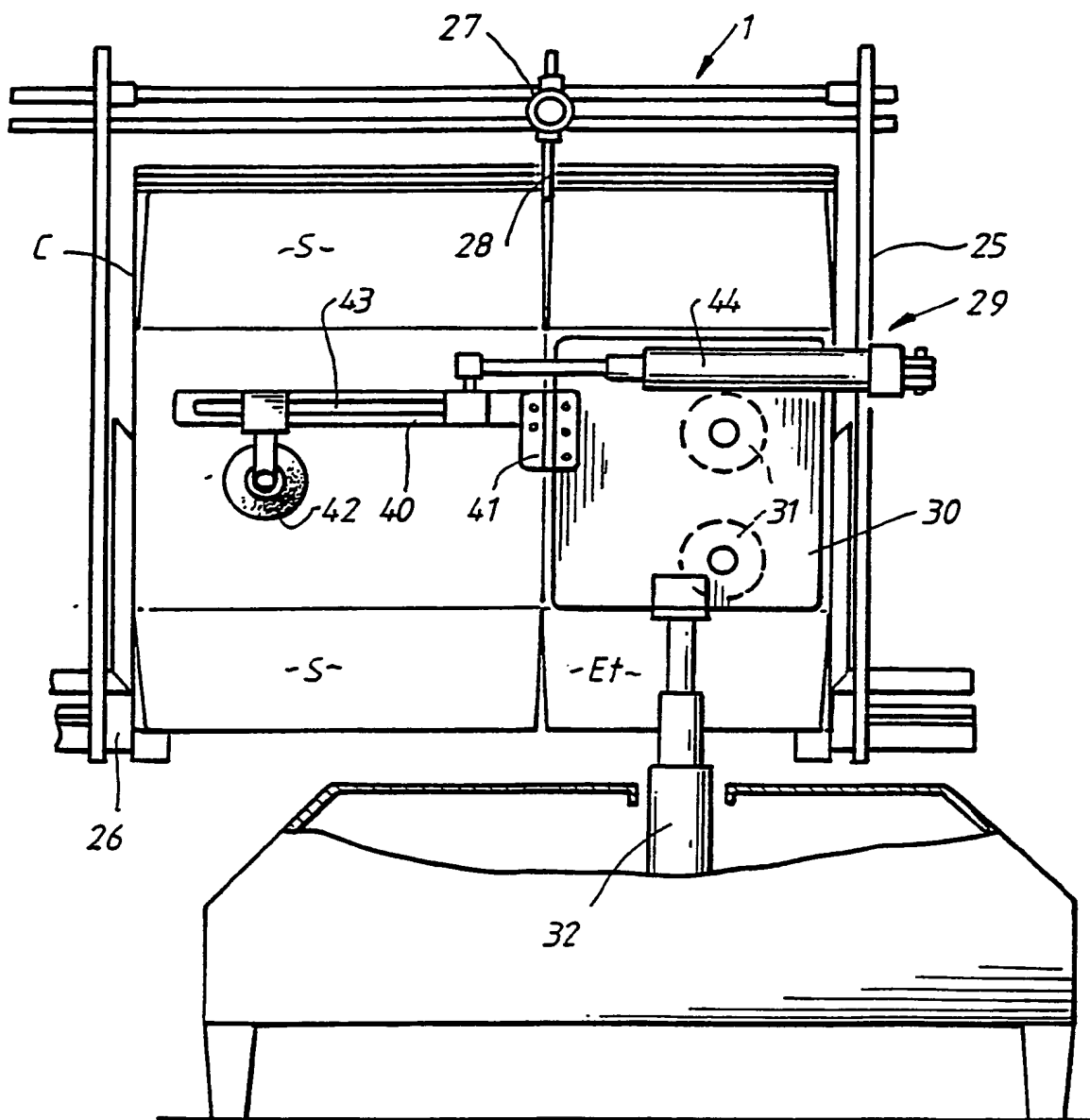
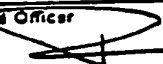


FIG. 9.

FIG. 11.

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 88/00249

I. CLASSIFICATION OF SUBJECT MATTER : 1. 19-0-01 classification symbol is 2201. indicate 511 5 According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. ⁴ B65B 7/20, 5/02		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC	B65B 7/20, 5/02	
Documentation Searched other than Minimum Documentation to the extent that such documents are included in the fields searched *		
AU : IPC as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
A	DT,A, 2617080 (NORDISHER) 20 October 1977 (20.10.77).	(1-6,13)
A	US,A, 3442062 (LENSE) 6 May 1969 (06.05.69)	(1-6,13).
A	US,A, 4317320 (NIGRELLI) 2 March 1982 (02.03.82)	(1-6,13)
A	FR,A, 1040542 (LEVER BROTHERS) 15 October 1953 (15.10.53)	(9-12)
A	DE,A, 3417508 (KNUTH) 14 November 1985 (14.11.85)	(9-12)
A	US,A, 3673764 (BELL et al) 4 July 1972 (04.07.72)	(1-6,13)
* Special categories of cited documents: ** -A- document defining the general state of the art which is not considered to be of particular relevance -E- earlier document but published on or after the international filing date -L- document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) -O- document referring to an oral disclosure, use, exhibition or other means -P- document published prior to the international filing date but later than the priority date claimed -T- later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention -X- document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step -Y- document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. -A- document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search 16 September 1988 (16.09.88)		Date of Mailing of this International Search Report 21 OCTOBER 1988 (21.10.88)
International Searching Authority Australian Patent Office		Signature of Authorized Officer  P. WARD